

What is claimed is:

1. A method for manufacturing pharmaceutical water in a plurality of sequential unit operations having mechanical equipment components and sanitizing said mechanical equipment components, said method comprising:
  - (a) feeding chlorinated water to a pharmaceutical water manufacturing process;
  - (b) removing hardness from said chlorinated water in a water softener;
  - (c) subjecting the softened water to dechlorination;
  - (d) distilling said dechlorinated water in a mechanical vapor compression distillation still where purified distilled water is produced and low-pressure steam is generated;
  - (e) passing a portion of said low-pressure steam generated in said still to one or more locations within said plurality of sequential unit operations subsequent to the point of dechlorination but prior to the location of said still and utilizing said portion of said low-pressure steam to sanitize the mechanical equipment components at said one or more locations; and
  - (f) withdrawing said distilled water from said still and storing it as manufactured pharmaceutical water.
2. The method of claim 1, wherein said chlorinated water initially fed to said pharmaceutical water manufacturing process has a chlorine content higher than about 0.25 ppm.
3. The method of claim 1, wherein said dechlorination of the softened water is conducted in one or more adsorption carbon filters.
4. The method of claim 1, wherein the chlorine content of said dechlorinated water is lower than about 20 ppb.

5. The method of claim 1, wherein said low-pressure steam generated in said still is saturated steam at a pressure of between about 1 and about 7 psig.

5 6. The method of claim 1, wherein said portion of said low-pressure steam utilized to sanitize said mechanical equipment components is distributed throughout said one or more locations in an amount and for a period of time sufficient to raise the temperature at said locations to between about 205° F and 215° F and maintain said mechanical equipment components at said locations at said temperature of between about 205° F and 215° F for at least about 45 minutes.

10

7. The method of claim 1, further comprising subjecting said chlorinated water initially fed to said pharmaceutical water manufacturing process to filtration in at least one multimedia filter whereby suspended solids are removed from the chlorinated water.

15

8. A method for manufacturing pharmaceutical water in a plurality of sequential unit operations having mechanical equipment components and sanitizing said mechanical equipment components, said method comprising:

20 (a) subjecting chlorinated water having a chlorine content higher than about 0.25 ppm to filtration in at least one multimedia filter whereby suspended solids are removed from the chlorinated water;

(b) removing hardness from said multimedia-filtered water in a water softener;

25 (c) subjecting the softened water to dechlorination in one or more adsorption carbon filters;

(d) distilling said dechlorinated water in a mechanical vapor compression distillation still where purified distilled water is produced and saturated steam at a pressure of between about 1 and about 7 psig is generated;

30 (e) passing a portion of said low-pressure steam generated in said still to one or more locations within said plurality of sequential unit operations subsequent to the point of dechlorination but prior to the location of said

still and utilizing said portion of said low-pressure steam to sanitize the mechanical equipment components at said one or more locations; and  
(f) withdrawing said distilled water from said still and storing it as manufactured pharmaceutical water.

5

9. The method of claim 8, wherein said portion of said low-pressure steam utilized to sanitize said mechanical equipment components is distributed throughout said one or more locations in an amount and for a period of time sufficient to raise the temperature at said locations to between about 205° F and 215° F and maintain  
10 said mechanical equipment components at said locations at said temperature of between about 205° F and 215° F for at least about 45 minutes.

10. The method of claim 9, further comprising removing ammonia compounds from said dechlorinated water in a polishing water softener prior to distilling said  
15 dechlorinated water in said mechanical vapor compression distillation still.

11. A system for manufacturing pharmaceutical water in a plurality of sequential unit operations having mechanical equipment components and sanitizing said mechanical equipment components, said system comprising:

20 (a) means for feeding chlorinated water to a pharmaceutical water manufacturing process;

(b) a water softener, connected to said means for feeding chlorinated water, for removing hardness from said chlorinated water feed;

(c) means, connected to said water softener, for dechlorinating said soft  
25 water;

(d) a mechanical vapor compression distillation still where purified distilled water is produced and low-pressure steam is generated;

(e) pipe means, connected to said still, for passing a portion of said low-pressure steam generated in said still to one or more locations within said  
30 plurality of sequential unit operations subsequent to the point of dechlorination but prior to the location of said still and utilizing said

portion of said low-pressure steam to sanitize the mechanical equipment components at said one or more locations; and

(f) means for withdrawing said purified distilled water from said still and storing it as manufactured pharmaceutical water.

5

12. The system of claim 11, wherein said chlorinated water initially fed to said pharmaceutical water manufacturing process has a chlorine content higher than about 0.25 ppm.

10

13. The system of claim 11, wherein said means for dechlorinating said soft water comprise one or more adsorption carbon filters.

14. The system of claim 11, wherein the chlorine content of said dechlorinated water is lower than about 20 ppb.

15

15. The system of claim 11, wherein said mechanical vapor compression distillation unit generates saturated steam at a pressure of between about 1 and about 7 psig.

20

16. The system of claim 11, wherein said pipe means, connected to said still, pass said portion of said low-pressure steam to said one or more locations and distribute said portion of steam throughout said one or more locations in an amount and for a period of time sufficient to raise the temperature at said one or more locations to between about 205° F and 215° F and maintain said mechanical equipment components at said one or more locations at said temperature of between about 205° F and 215° F for at least about 45 minutes.

25

17. The system of claim 11, further comprising multimedia filtering means, connected to said water softener, for filtering said chlorinated water feed whereby suspended solids are removed from said chlorinated water.

30

18. A system for manufacturing pharmaceutical water in a plurality of sequential unit operations having mechanical equipment components and sanitizing said mechanical equipment components, said system comprising:

(a) multimedia filtering means for subjecting chlorinated water having a chlorine content higher than about 0.25 ppm to filtration whereby suspended solids are removed from the chlorinated water;

(b) a water softener, connected to said multimedia filtering means, for removing hardness from said multimedia-filtered water;

(c) one or more adsorption carbon filters, connected to said water softener, for dechlorinating said soft water;

(d) a mechanical vapor compression distillation unit where purified distilled water is produced and saturated steam at a pressure of between about 1 and about 7 psig is generated;

(e) pipe means, connected to said mechanical vapor compression distillation unit, for passing a portion of said saturated steam generated in said distillation unit to one or more locations within said plurality of sequential unit operations subsequent to the point of dechlorination but prior to the location of said distillation unit and distributing said portion of said saturated steam throughout said one or more locations; and

(f) means for withdrawing said purified distilled water from said distillation unit and storing it as manufactured pharmaceutical water

19. The system of claim 18, wherein said pipe means, connected to said mechanical vapor compression distillation unit, distribute said portion of said saturated steam throughout said one or more locations in an amount and for a period of time sufficient to raise the temperature at said one or more locations to between about 205° F and 215° F and maintain said mechanical equipment components at said one or more locations at said temperature of between about 205° F and 215° F for at least about 45 minutes.

20. The system of claim 19, further comprising a polishing water softener,  
connected to said mechanical vapor compression distillation unit, for removing  
ammonia compounds from said dechlorinated water prior to subjecting said  
5 dechlorinated water to said distillation.

10

15